



In Situ Bioreactor: New process characterizes, treats contamination in ground

Doctors typically treat symptoms until they learn the source of a patient's illness. Then, a focused regimen is prescribed for a cure.

America's environmental cleanup experience is similar. Hundreds of thousands of suspected sites exist in the nation until contaminated sources are identified and treated.

Current estimates are that it will take \$300 billion and more than 70 years to restore our environment, unless efforts are accelerated.

At Idaho National Laboratory, researchers have responded with a bioreactor technology that permits identification bioremediation testing and treatment at the source, using naturally occurring microbes to disarm contaminants.

"Our team has invented and patented a subsurface reactor that we insert into a contaminated zone like a biopsy needle into a tumor. Once inserted, we use the reactors to test and identify effective cleanup treatments," said INL scientist Brad Blackwelder. "This saves a tremendous amount of time and money as compared to a conventional laboratory setting. The subsurface reactor also gives results that are much more like the actual field because the reactors operate in the contaminated zone."

After the two-foot-long, four-inch diameter In Situ Bioreactor is inserted into the area, researchers draw fluid through the soil core. Then, selected treatment options are diffused through the core soil under investigation. As they pass through the soil core, the effect of the treatments on the contaminant may be clearly observed.

In addition to treating the problem at the source, the In Situ Bioreactor offers several more benefits. It:

- Offers the only flow-through, undisturbed underground lab-scale investigation;
- Recruits native microbes, and is the only technology to do so;
- Presents the fastest path to successful pilot-scale studies;
- Optimizes full-scale remediation projects;

- Currently serves as the only source to critically analyze contamination remobilization for long-term stewardship; and
- Reduces cost.

Industry experts have tested the Bioreactor and characterized it as “very valuable,” especially in “bridging the gap between laboratory microcosm studies and full-scale implementation.”

An industry leader writes, “we expect that it will become a standard, preferred approach...”

“The reactor design allows us to inject a treatment, which flows through the soil core. We can extract the treatment to see what happens to it, and further, we can see what happens to the contaminant within the soil core, which is removable,” said INL scientist Corey Radtke. “This allows us to choose a successful cleanup method.”

By identifying the right microbe, watching its interaction and then stimulating it as necessary, natural processes delivered by this new technology treat the source of the problem to restore the area.

The Bioreactor is:

- On site;
- Within the source zone; and
- Directly testing treatments.